SITE NEED STATEMENT

General Reference Information

Need Title: **Down-Hole, Real-Time Monitoring of Radiation (Mainly Tritium) in Boreholes**
Need Code: NV01-0200-01S
Need Summary: An instrument is needed to perform daily, in situ, low-level radiation measurements in deep monitoring wells. Tritium is the principal radionuclide. Other needed measurements are temperature, pH, electrical conductivity, water level, and total gamma.
Origination Date: August 1, 2001
Need Type: Science
Operations Office: NNSA/NV
Geographic Site Name: Nevada Test Site
Project: NV212/Underground Test Areas
National Priority: Medium
Operations Office Priority: 1 of 13

Problem Description Information

Operations Office Program Description: The NNSA/NV Environmental Restoration Program encompasses activities that assess the degree of contamination resulting from the testing program at the Nevada Test Site, the Nellis Air Force Range, the Tonopah Test Range, and eight offsite locations, and performs actions required by federal and state regulations. The objects of the Program are to: (1) estimate the maximum extent of contaminant migration, (2) determine its potential risk to the public and the environment, and (3) perform the necessary corrective actions in compliance with applicable regulatory guidelines and requirements.

Need/Problem Description: An instrument is needed to perform daily, in situ, low-level radiation measurements in deep groundwater monitoring wells. Tritium is the principal radionuclide. Other needed measurements are temperature, pH, electrical conductivity, water level, and total gamma.

Functional Performance Requirements:

- Outer Diameter: 1.75 inches
- Remotely monitored
- Depth of Placement: 800 to 5,000 feet
- Hydrostatic Pressure: 0 to 1,800 psi
- Temperature: 50° to 135° F
- Duty Cycle: 50 years
- Maintenance Cycle: No more than annually
- Conventional Electricity: Unavailable
- Resolution: 1,000 pCi/L (300 pCi/L preferable)
- Accuracy: 10 percent
- Range: 1,000 to 200,000 pCi/L
- Frequency of Measurements: Daily
- Additional Measurements: temperature, pH, electrical conductivity, water level, total gamma

Definition of Solution: Down-hole tritium monitors are needed to perform low-level radiation measurements on groundwater in deep monitoring wells at NTS sites, where tritium is the principal radionuclide of interest. Currently, the UGTA program plans to monitor 56 wells per year.
Targeted Focus Area: Subsurface Contaminants
Potential Benefits: Efficient in situ sampling and analysis will result in cost savings over the long-term monitoring period of up to 100 years.
Potential Cost Savings: The cost savings is estimated at $361 million over a 100 year monitoring period in present day dollars if implemented at all projected groundwater wells.
Potential Cost Savings Narrative: The cost savings is estimated at $361 million over a 100 year monitoring period in present day dollars if implemented at all projected groundwater wells. However, potential cost savings are linked with that of need NV02-0200-02S, "Deep Well Sampling". It will not be necessary to implement both of these needs at the same well. Consequently, the total potential baseline cost savings are not simply the cumulative cost savings for both technology needs. For example, if an in situ radiation/tritium detector were installed for a well, it would eliminate the need for

	deep well sampling at that well. Likewise, deep well sampling will likely need to take place at some wells; in these cases, an in situ monitor would not be installed. The costs of technology implementation for this need will be refined with time as the strategy for well monitoring and sampling is further defined.
Technical Basis:	A technology is needed for monitoring radionuclide levels in groundwater at great depths in remote areas while minimizing costs associated with sample collection.
Cultural/Stakeholder Basis:	Perceived or actual risk can be better addressed and managed.
Environment, Safety, and Health Basis:	Tritium is the primary contaminant of concern in groundwater impacted by past underground nuclear testing. In situ monitoring reduces worker exposure from sampling groundwater. An increased understanding of tritium in groundwater will lead to better protection of the public from potentially contaminated groundwater.
Regulatory Drivers:	As part of the Nevada Federal Facilities Agreement and Consent Order (FFACO), it is anticipated that long-term monitoring of groundwater for at least 100 years will be required for groundwater units at the NTS impacted from past underground nuclear testing. Two Offsites in Nevada are similarly covered by this agreement and consent order. Negotiations with regulators regarding other Offsites will likely lead to long-term groundwater monitoring requirements, with tritium being the primary radionuclide of concern.
Milestones:	Milestones for characterization and modeling are incorporated in the FFACO.
Material Streams:	Rad contaminated groundwater (1209) Technical risk score 3. Not on critical path to closure.
TSD System:	Not Applicable
Major Contaminants:	Radionuclides, with tritium being the primary contaminant of concern.
Contaminated Media:	Groundwater
Volume/Size of Contaminated Media:	Large, but not able to estimate at this time
Earliest Date Required:	2001
Latest Date Required:	2010

Baseline Technology Information

Baseline Technology Process:	Presently, large volumes of potentially contaminated water are pumped from deep wells with either dedicated pumps or pumps set for each sampling. The pumps set for each sampling require a drill rig or similar equipment that is expensive to operate. The current system requires considerable decontamination of equipment and disposal of contaminated water. Monitoring requirements are projected to continue for 100 years.
Life-Cycle Cost Using Baseline:	The conceptual cost estimate is $420 million in present day dollars to conduct well sampling and monitoring. This cost will be updated as more information becomes available.
Uncertainty on Baseline Life-Cycle Cost:	This project can be completed using the baseline technology, therefore, there are no technical risk factors involved in any uncertainty of the life-cycle baseline cost.
Completion Date Using Baseline:	Monitoring for tritium is expected to last for the next 100 years.

Points of Contact (POC)

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